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ABSTRACT

A challenge in online collaborative learning teams is assuring that all members of the virtual learning team are actively engaged and contributing to the work of the team. One strategy to hold individual members of a learning team accountable for their contributions is through the use of peer and self evaluations. This paper provides a summary of an analysis of peer and self evaluations as part of an ongoing study of the use of peer and self assessment in online collaborative learning environments. The subjects of the study were on-campus and off-campus students, who were enrolled in a Web-based graduate course in collaborative learning. Based on a factor analysis of repeated self and peer evaluations, two factors were identified. This study focuses on developing a deeper understanding of the two factors. The nesting of the self and peer evaluations and the dependency of the repeated measures data guided the use of a hierarchical mixed effects linear model with the two factor scores as the dependent variable and self or peer, team, assessment time, gender and campus presence as the predictors. Among the findings are that students change their evaluations of themselves and peers over time, showing more differences as time goes on. Gender differences are also noted in their scores. Off-campus men were found to decrease their task performance and their contribution to the positive social interaction with time. (Contains 25 references.) (Author)

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Self and Peer Assessment in an Online Collaborative Learning Environment

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Abstract

A challenge in online collaborative learning teams is assuring that all members of the virtual learning team are actively engaged and contributing to the work of the team. One strategy to hold individual members of a learning team accountable for their contributions is through the use of peer and self evaluations. This paper provides a summary of an analysis of peer and self evaluations as part of an ongoing study of the use of peer and self assessment in online collaborative learning environments. The subjects of the study were on-campus and off-campus students who were enrolled in a web-based graduate course in collaborative learning. Based on a factor analysis of repeated self and peer evaluations, two factors were identified. The present study focuses on developing a deeper understanding of the two factors. The nesting of the self and peer evaluations and the dependency of the repeated measures data guided the use of a hierarchical mixed effects linear model with the two factor scores as the dependent variable and self or peer, team, assessment time, gender and campus presence as the predictors. Among the findings are that students change their evaluations of themselves and peers over time, showing more differences as time goes on. Gender differences are also noted in their scores. Off campus men decrease their task performance and their contribution to the positive social interaction with time.

Introduction

There is growing interest in the use of collaborative learning in web-based courses. Among the challenges posed by the use of virtual learning teams is assuring that members of the learning team actively participate and contribute to the team's learning projects. As part of ongoing research on the use of self and peer assessment in online collaborative learning environments, this study is focused on an analysis of factors related to self and peer assessment in a web-based graduate level course on computer-supported collaborative learning. Factor 1 relates to the active process of engagement in actions that result in the successful completion of collaborative tasks in the online course and Factor 2 relates to the social dimension of human interaction required for the positive and successful interaction in groups. Factor 1 appears to be the online reflection of the personal characteristics of Instrumentality and Factor 2 of Expressiveness.

The subjects in the study included: 1) on-campus students who were enrolled in degree programs in a large urban Southwestern research university; and 2) off-campus students who were enrolled in a web-based degree program in instructional technology offered through the university system. The virtual learning teams formed in the course were balanced with both on and off-campus students as well as other factors such as gender, technology expertise, and cultural background. 75% of the students were women and 25% men.

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There has been growing interest in the use of peer and self assessment as a tool to hold individual members of a collaborative learning team accountable for their contributions to the team's learning projects.

Assessment may serve three purposes. Assessment may be used as the basis for allocating a grade (a form of summative assessment), to provide feedback to guide or improve practice (formative assessment), or to compare the effectiveness of curriculum elements (comparative assessment). (Wolz et al., 1997, p. 62). In this study, the peer and self assessments were used in part to determine their grade and, more importantly, as a means of providing group members with feedback related to their efforts and work on online team projects.

Van Merriënboer (1997) conceives of self-assessment and peer-assessment as complex skills or as a skills hierarchy. He suggests that self assessment can be defined as the students taking responsibility for monitoring and making judgments about characteristics of their own learning. Students are required to think critically about what they are learning and to identify performance standards, and to apply them in the assessment of their own work. Van Merriënboer defined peer-assessment as an assessment in which the student takes responsibility for making critical judgments about the learning of peers and applying the agreed on standards to the work of their peers. (Van Merriënboer, 1997).

Sluijsmans & Moerkerke (1999) report that students become more involved in the learning and in the assessment process. They find that self-assessment promotes more reflection on one's own work and products of higher quality. Boud (1990) stresses that higher education assessment practices need to be compatible with the curricular goals. Sluijsmans_& Moerkerke (1999) state that one of these goals should be that students take responsibility for their own learning and at the same time evaluate their own learning at different phases in the instruction process.

Current Instructional technology perspectives of learning (e.g. Brown, Collins & Duguid, 1989; Duffy & Jonassen, 1992; Brooks & Brooks, 1993; Duffy & Cunningham, 1996; Jonassen, 1996; Maddux et al, 1997) leads us to view knowledge as constructed uniquely by the individual, in multiple ways, through a variety of authentic tools, resources, experiences, and contexts. Social interaction introduces multiple perspectives through reflection, collaboration, negotiation, and shared meaning. If we consider that learning is both an active and reflective process, and that the reflection in the personal learning process is a key component and together with the process in which the peers engaged can be used.

The impact of individual characteristics on learners' success in hypermedia environments has been documented in Dillon and Gabbard (1998) review of the hypermedia research literature. Hartley and Bendixen (2002) state that there is a need for better conceptualization of the impact of learner attributes like self-regulation and epistemological beliefs in new hypermedia learning environments, and also there is a need to examine how different learners can benefit or not benefit from their use. They argue that it is essential to better comprehend how learners' characteristics impact their ability to succeed in environments that are very different from traditional learning situations and they stress the importance of looking at characteristics that research demonstrated to be important in learning.

The online medium seems to influence collaboration along several dimensions. Verdejo (1996) emphasizes the verbal exchanges among learners, centering collaborative learning on a "conversation or dialogue paradigm". Following his view, if we consider learning as a process that occurs in a reflexive dialogue, then the conversation precedes the action. Some of the time we engage in conversation with our own selves and we prompt ourselves to action. Other times the conversation or exchange of words -the social interaction- becomes like the glue that bonds a community. At the same time, the social interaction is the building block that keeps together the learning community and through which learning occurs and products are developed.

Recently, Menchaca and Resta (2002), borrowing from earlier gender research that described the personal characteristics of masculinity and femininity (Spence & Helmrich, 1978), lately named "Instrumentality" and "Expressiveness", reported two similar factors found in a study of the peer and self Online Teamwork Assessment Scale (OTAS). In their initial exploratory study, two personal characteristics "Instrumentality" and "Expressiveness" appear as the OTAS factors and seem to be determining the online interactions of students in online collaborative learning groups.
The self and peer assessment data seem to be measuring two constructs underling the process of online collaborative learning work: Instrumentality and Expressiveness.
The high presence of both personal characteristics "Instrumentality" Factor 1 and "Expressiveness" Factor 2 expressed in action and interaction is important for team success in online learning environments.

The successful attainment of tasks and positive social interaction in online learning communities requires the presence two dimensions: One, a self management personal dimension or "Instrumentality", similar to the personal characteristics called masculinity by Spence & Helmrich (1978). Instrumentality leads learners to be involved and accomplish tasks that promote the team goals. Two, a social interaction skills dimension or "Expressiveness" previously called femininity, necessary to maintain the positive social climate. The electronic world of work shared by modern men and women, requires the exercise of instrumentality for successful professional activities. It is also important to maintain satisfying personal relationships in a promotive social climate. Effective team work is enhanced through positive expressiveness and empathy that promotes constructive interaction and the well being of others. Both characteristics represent the sine qua non ingredients of successful interaction and attainment of the group common goals (Menchaca & Resta, 2002).

Materials and Methods
When faced with the task of self assessment (SA) or peer assessment (PA), students from diverse backgrounds experience a significant degree of difficulty with the task. Self or Peer Assessment requires a learning process for the student to become comfortable with the assessment task. Gender of the peer evaluator may also be a factor. The following questions are important in developing a better understanding of the use of peer and self assessment.

- Does peer and self-assessment carried on in an online collaborative community of practice reflect the team interaction process?

- What does the repeated peer and self-assessment process reveal of the teamwork process? Is there a training effect on the student ratings over time?
- Do self assessment (SA) or peer assessments (PA) provide significantly different results?
- How do peer and self-assessment vary across time for different teams, campus presence and gender?

The course used in the study was entirely web-based with all course materials made available and all communication taking place online. There were 22 students in the course and they worked together in completing four projects. Three fourths were women. Roughly half were students who were on-campus students and the other half were distance education students from areas across the state and country. Web-based forms of the Peer and Self Online Teamwork Assessment Scale and rubrics were used at the end of each project by students in performing the peer and self assessment. Peers also conducted assessments of the other teams products as well as their own at the end of each project. Student's grades were composed of both individual and collaborative scores. The assessments were anonymous and only the student and the instructor could view the peer assessment scores which were based on the average of the ratings of the self and peer assessment.

The data analysis focused on understanding how the factors changed throughout the repeated measures of the course, between self and peer assessment, gender, campus presence and teams. A hierarchical mixed effects linear model was used as indicated by nature of the nesting and repeated measures of the peer and self assessment data. Because evaluations of the same person are similar, evaluations of peers coming from the same student are similar and the self evaluations are also similar, we selected a data analysis model that takes into account the nesting and dependencies of the data. The rating a student makes of peers reflects personal attitudes, beliefs and interpersonal style. In the same manner, a student views their own performance and contributions through a uniquely personal perspective.

Table 1. Covariance Parameter Estimates

Variation due to	Estimate	Standard Error	Z Value	Probability of Z
Student	0.02724	0.01196	2.28	0.0114
Evaluator	0.01100	0.004957	2.22	0.0133
Residual	0.1100	0.006079	18.10	<.0001

The mixed effect hierarchical model had the two factors of collaborative teamwork, instrumentality and expressiveness as the dependent variable. In the model the predictors were: self or peer evaluation, assessment time, team, gender, campus presence, and the interaction between self/peer by time and gender by time interaction. In order to be able to simultaneously explore the two factors a dummy variable was created, Whichfact that stands for which factor. Which Factor was significant in this model (Whichfact $F_{1,655}$ =

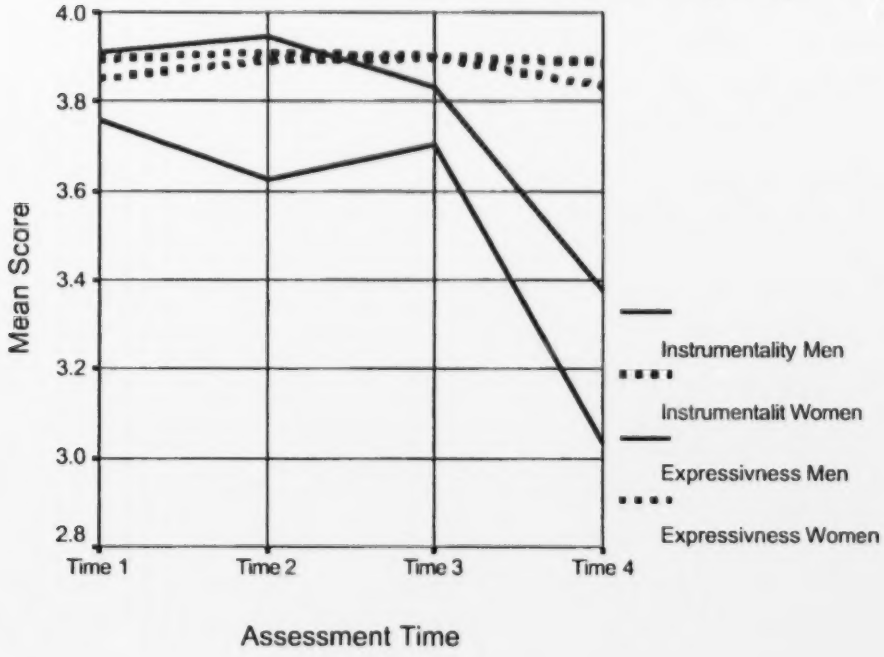
12.39 p = 0.0005 Table 2). More variance (variance for Student = 0.027 Table 1) is explained by the student then by the evaluator (variance for Evaluator = 0.011 Table 1).

Table 2. Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
SELF	1	655	0.53	0.4689
TIME	3	655	22.93	<.0001
GENDER	1	655	8.80	0.0031
TEAM	5	655	0.85	0.5160
INCAMPUS	1	655	1.41	0.2359
SELF*TIME	3	655	3.40	0.0174
TIME*GENDER	3	655	32.03	<.0001
WHICHFAC	1	655	12.39	0.0005

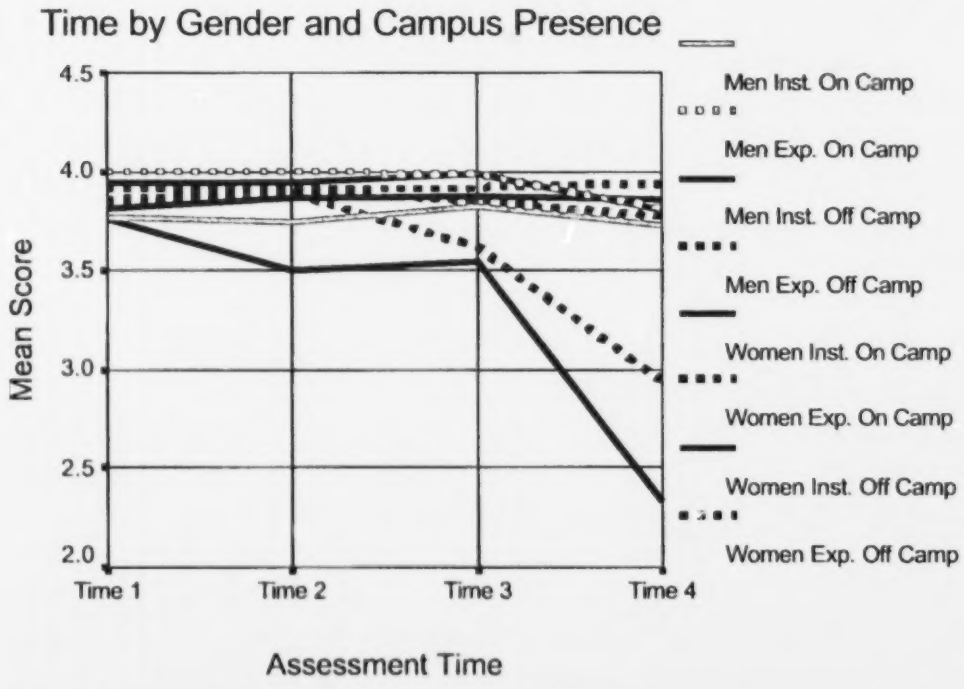
Through repeated practice on peer and self assessment over time, students learned to perform the evaluation process to reflect their assessment of the differential performance of others (Self by time $F_{3,655} = 3.40$ p =.0174, Table 2). The main effect of Self versus Peer was not significant (Self by time $F_{1,655} = 0.53$ p =.0.4689, Table 2).

Figure 1.Mean Factor Scores Change by Time



However, it is interesting to note that in some instances of missing data, when a student gives evidence online of not sharing their teamwork load rather than completing a self assessment in which they would have difficulty in rating themselves high on very specific indicators of active contribution to the team, they would choose to not complete the self evaluation.

Figure 2 Mean Factor Scores Change



The data also suggests the possibility of cross-cultural differences in the assessment experienced by students. There are some indications of reluctance to rate peers other than at a high level by some students. Further research needs to be conducted across students with different cultures to determine the extent to which culture may represent an important factor in peer evaluation.Students varied in the way they performed the evaluations over time (Time $F_{3,655}$=22.93 $p < .0001$Table 2 and Figure 1). At the end of the course students assigned lower scores to themselves and to classmates they viewed as not performing according based on criteria presented in rubrics for a high score. Men and women also differed in the way they were evaluated by their classmates (Gender $F_{1,655}$ = 8.80 $p = 0.0031$, Table 2 and Figure 1). Gender differences interacted with evaluation time (Time by Gender $F_{1,655}$ = 8.80 $p = 0.003$, Table 2 and Figure 1). Women's scores tended to stay high while men's scores tended to decrease over time although all peer and self assessment tasks were performed with the rubric for the quality of their collaboration.

The analysis indicated that students change the way they evaluate themselves and peers over time. In the process of self and peer assessment, students reflected on the

performance of team members toward their goals (Instrumentality). The quality of team social interaction (Expressiveness) is also reflected in their observations of performance of their peers. Factor 1 relates to the active process of engagement in actions that result in the successful completion of tasks and Factor 2 relates to the social dimension of human interaction required for the positive and successful interaction in groups. In the mixed effect hierarchical model used no significant differences were found between teams (Teams $F_{5,655} = 0.85$ $p = 0.5160$) and campus presence (Campus $F_{1,655} = 1.41$ $p = 0.2359$, Table 2).

In summary, the analysis of the self and peer assessments within a web-based course indicates that there is increased differences in peer and self evaluations over time that may reflect a training effect of students becoming more comfortable and competent in performing peer and self evaluations. It is also interesting to note consistent gender differences in peer evaluation. Also of interest is the observation that off-campus male students tend to decrease their task performance and contributions to positive social interaction of the team over time. The questions raised by these findings will be examined in further studies of the peer and self assessment process in online collaborative learning teams.

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